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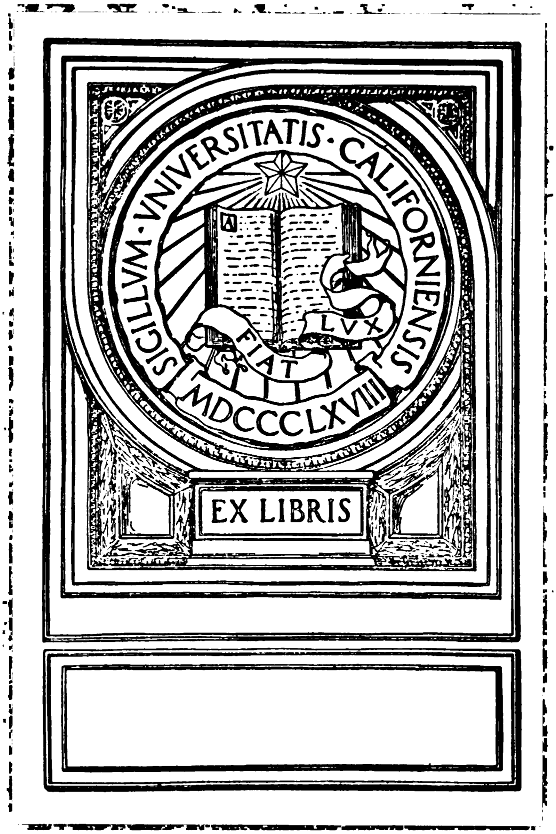

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The fundamental purpose of labor legislation is the conservation of the human resources of the nation.

PUBLICATION No. 10.

American Association for Labor Legislation

First National Conference ON INDUSTRIAL DISEASES

Chicago, June 10, 1910

NEW YORK:
AMERICAN ASSOCIATION FOR LABOR LEGISLATION,
METROPOLITAN TOWER, 1 MADISON AVE.
1910

PUBLICATIONS

American Association for Labor Legislation

- Proceedings First Annual Meeting, Madison, Wis., December 30-31, 1907.
  - Economic Theory and Labor Legislation, Richard T. Ely.
  - The Normal Work Day in Coal Mines, Thomas K. Urdahl.
  - Workingman's Insurance in Illinois, Charles R. Henderson.
  - A Program of Social Legislation, Henry R. Seager.
- Proceedings Second Annual Meeting, Atlantic City, N. J., December 29-30, 1908.
  - Some Fundamental Distinctions in Labor Legislation, Henry W. Farnam.
  - The American Way of Distributing Industrial Accident Losses, Crystal Eastman.
  - What Form of Workingmen's Accident Insurance Should Our States Adopt? Max O. Lorenz.
  - Canadian Industrial Disputes, Adam Shortt and Victor S. Clark.
- Proceedings Third Annual Meeting, New York City, December 28-30, 1909.
  - Labor Legislation and Economic Progress, Henry W. Farnam.
  - Judicial Limitations and Labor Legislation, Ernst Freund.
  - The Problem of Labor Legislation under our Federal Constitution, Frederick N. Judson.
  - Precedent Versus Conditions in Court Interpretation of Labor Legislation, George G. Groat.
  - Constitutionality of Workmen's Compensation Acts, H. V. Mercer.
- Industrial Hygiene, Leaflet No. 1, A. A. L. L. Proposed Investigation of Occupational Diseases.
- "The Bulletin of the I. L. O.," Leaflet No. 2, A. A. L. L. A Critical Announcement.
- Report of General Administrative Council Meeting, A. A. L. L., Chicago, April, 1909.
- Employers' Liability, Publications N. Y. State Branch, A. A. L. L. No. 1, Crystal Eastman.
- Proceedings First National Conference on Industrial Disases, Chicago, June 10, 1910.
- Legislative Reviews:*
  - No. 1. Review of Labor Legislation of 1909, Irene Osgood.
  - No. 2. Industrial Education, summary of laws in force 1909, Edward C. Elliott.
  - No. 3. Administration of Labor Laws, summary of laws in force 1909, Charles B. Austin.
  - No. 4. Woman's Work, summary of laws in force 1909, Maud Swett.
  - No. 5. Child Labor, summary of laws in force 1910, Laura Scott.
  - No. 6. Review of Labor Legislation of 1910, Irene Osgood Andrews,

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*The early copies of the first editions of Nos. 2, 3, and 4, were numbered "Legislative Summary No. 1."

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1910

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Princeton University Press,
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Committee on Memorial

As an expression of the spirit of those, who, from widely separated parts of the United States, attended the first American conference on industrial diseases, the following resolution was unanimously adopted:

"*RESOLVED,*

> By the first National Conference on Industrial Diseases, that the President of the American Association for Labor Legislation be asked to appoint a special committee of five, with power to add to their number, to call upon the President of the United States and present to him at an early date a carefully prepared memorial of facts and conclusions, emphasizing the urgent necessity and practical expediency of a national expert enquiry into the whole subject of industrial or occupational diseases,—their relative degree of frequency in various trades and occupations, the causes responsible for their occurrence, the methods desirable and practicable for their prevention or diminution, and all other matters having a relation thereto including methods of amelioration and relief."

In accordance with this resolution, Professor Henry W. Farnam of Yale University, as President of the American Association for Labor Legislation, appointed the following members:

Henry Baird Favill, M.D., President Chicago Tuberculosis Institute.

Frederick L. Hoffman, Statistician Prudential Insurance Company of America, Newark.

David L. Edsall, M.D., of Philadelphia.

Frederick N. Judson, of St. Louis.

Charles R. Henderson, University of Chicago, Secretary Illinois Commission on Occupational Diseases.

M12735

PROGRAM

First National Conference on Industrial Diseases

Auditorium Hotel, Chicago

Friday, June 10th, 1910, 8:00 P. M.

Prof. Henry W. Farnam

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UNIV. OF
CALIFORNIA

INTRODUCTORY ADDRESS.

HENRY W. FARNAM.

In opening this First Conference on Industrial Diseases in the United States, I shall content myself with explaining briefly why it is that the American Association for Labor Legislation has called you together. Our Association is, as you know, one of the national sections of the International Association for Labor Legislation. At the meeting at which the formal organizaton of this society was adopted in 1900, the subject of industrial diseases was given a prominent position and has been studied and discussed at every meeting held since that time. It has a special Commission on the subject and in addition to detailed studies of particular poisons, the commission has framed a valuable list of industrial poisons. The results of these studies have been embodied in important pieces of legislation. The most remarkable of these was the treaty entered into in 1906 by seven of the principal states of Europe, which united in absolutely prohibiting the use of white phosphorus in the manufacture of matches. These states have since been joined by two others, so that this particular poison is under the ban of nine states. Not only the International Association but the other national sections have devoted a great deal of attention to the subject.

Our country is just beginning to appreciate the importance of industrial hygiene and the best work done in this field, has been done by members of this association. Among them I may mention particularly, Dr. George M. Kober of Washington, who has published a book upon the subject from the point of view of the physician; Mr. Frederick L. Hoffman of Newark, who, from the point of view of the statistician, has published valuable studies of certain diseases in Numbers 79 and 82 of the Bulletin of the Federal Bureau of Labor; Dr. John B. Andrews, the secretary of our

Association, who has just issued, in Number 86 of the Bulletin of Labor, a careful and intensive study of the subject of phosphorus poisoning, which we hope will lead to federal legislation on the subject.

But while a beginning has been made, we cannot expect to secure legislation that will stand and be effective without a more careful and detailed study of the individual facts in our own industries. The present situation of our Association is like that of a watchman on a high tower. He does not know exactly how the attack is to be made but he knows enough to justify him in giving the alarm and in advising that scouts be sent out to ascertain more precisely the strength and the position of the foe. In this warfare against industrial diseases we need the coöperation of many different people and one of the purposes of this Association is to facilitate this coöperation in order to prevent a waste of energy. This is a warfare in which science, labor, business enterprise, and the government must all unite. In science, we appeal especially to medicine, mechanical engineering, chemistry, statistics, and economics, to furnish us with the facts and to supply the methods of investigation and of prevention. But we equally need the help of labor, which, though it has the greatest immediate interest in the matter, is often handicapped by lack of scientific knowledge or by lack of the means of making itself heard. The trade unions and benefit societies may be of great service in pointing out fields of investigation. We also need the help of business enterprise. The manufacturers have in many cases already shown a commendable interest and a high degree of intelligence in dealing with the matter. The insurance companies have also contributed their quota and have much to gain by an improvement in the conditions. But, if we are to secure progress all along the line, which shall be uniform and not simply sporadic, we shall need the government in all three of its department. We need the legislature to enact the laws. We need the administration, above all an honest administration, based upon merit, to secure their execution;

and we need a judiciary to interpret them according to broad principles. The recent decision of the Supreme Court of Illinois upholding the Ten Hour Law for Women is an encouraging sign of the times which this Association cordially recognizes. Our part in the matter consists in securing accurate and reliable data and putting them before the legislature and the other organs of the government.

Our Association began its study of this subject some two years ago, by the appointment of a national commission on industrial hygiene, and early in 1909, we issued a special leaflet, outlining the proposed investigation of occupational diseases. The present conference is the continuation of that line of work. The present occasion seems a particularly fitting one, for industrial accidents and industrial diseases are but two different forms of industrial risks, and every country that has thus far successfully dealt with one, has felt itself obliged to deal with the other. We are, therefore, glad to hold the Conference on Industrial Hygiene in connection with the Conference on Accidents. Equally fitting is the place, for Illinois is the first of our states to appoint a State Commission on Occupational Diseases, and Chicago is known throughout the world for its progressive spirit. The Chairman of our commission on industrial hygiene is a Chicago man, and in turning over to him the task of presiding over this meeting, I need make no formal introduction, for you all know and esteem Dr. Favill, the President of the Tuberculosis Institute.

IMPORTANCE OF INDUSTRIAL HYGIENE.

HENRY BAIRD FAVILL.*

The idea implied in the modern movement toward an Industrial Hygiene is regulation; determination of standards of living and working, and the incorporation of these into more or less specific statute. This will go far, for in addition to its effectiveness as a health measure, it will be clearly educative in its operation. It will not, however, be radical nor stable without further development. By as much as health regulation is mandatory upon the parties in interest, by so much is the effectiveness limited by the letter rather than fostered by the spirit.

There is apparent no way to advance industrial hygiene but through police measures. Before real values are reached, however, there is to be struck a deeper note. An ideal of health as the chief concern of the worker; as the measure of power in the mass.

When the individual puts his life interest into proper relation and finds health the foundation of his happiness and prosperity, he will have a basis for choice as to conditions in which he will work. When those shaping industrial policies realize that production is in fact proportioned to health and happiness, they will find ways to economise the health resources of their people.

Those lines of growth are to coincide before much is accomplished. Of the two, the employers, the leaders of industry, will reach the conception first.

It is safe to predict that the efforts of those who agitate the matter will bear fruit with the management of industries long before it has a vital meaning to the workers. Ultimately they must come together, and upon what ground?

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*Owing to the pressure of public and professional duties Dr. Favill was unable to write out his address in advance. In a twenty minute address he spoke earnestly of the need of wider interest in the health problems of modern industry. Unfortunately there is no stenographic report of Dr. Favill's address, but he has kindly furnished these few notes as representing the gist of his remarks as presiding officer.

Mutual interest can be assumed by the economist, agitated by the sociologist, recognized by the legislator, and yet the borders of this territory hardly be touched.

It is a matter of grave painstaking education. All classes in society must come to a recognition of the paramount value of health before a true issue can be defined. It is for future generations to realize the plans we are now hesitatingly and imperfectly projecting. The conception must start in childhood. It is a function of education.

This will not take as long as may be feared. The young are impressionable and very keen. There is no net-work of habit and tradition to entangle their feet. The schools in the next few years will accomplish wonders. But in the meantime actual material conditions must keep pace with this enlightenment. It will be a sorry picture if the child growing into an industrial factor finds working conditions that nullify any intelligence he may have acquired as to his health.

It is with reference to this situation that our greatest need for action becomes apparent. The State must not educate, elevate, and foster with one hand, and poison with the other.

As our children come along with ideals and habits which are of promise to the race, they must be met by conditions that are compatible with their progress. It is the imperative duty of the Government to find out what is wrong, what would be right, and promulgate its findings as a foundation for social benefit.

PHOSPHORUS POISONING IN THE MANUFACTURE OF MATCHES.

JOHN B. ANDREWS.

When England, in 1906, passed her famous Workmen's Compensation Act, she included in its classifications six industrial diseases. The list has since been increased to twenty-seven. In England, as in other European countries, the principle is now firmly established that a workman is entitled to compensation if he is incapacitated by a disease contracted in his trade and due to his employment, exactly in the same way as if he had been disabled by an accident.

One of the first six occupational diseases to come under the provisions of the British Act, was the malady due to phosphorus poisoning in the match industry. It has been known for seventy years that people who work in match factories where the poisonous phosphorus is used, sometimes contract a loathsome disease scientifically known as *phosphorus necrosis,* but popularly called "phossy jaw." The fumes and particles of phosphorus attack the bones of the workers, but more especially their teeth. The bones become brittle; the teeth drop out; the jaw bones decay.

Poisoning from phosphorus, however, has many evil effects. Some are local, others general. The general effect most frequently noted in cases of chronic phosphorus poisoning, is anaemia. The daily breathing of air laden with phosphorus fumes, and continual contact with the particles of phosphorus, results in a gradual lowering of vitality which in turn invites other forms of disease. This is one of the most prevalent and most serious results of phosphorus poisoning. But such general effects are much more difficult of actual determination, and consequently the local effects which are more conspicuous have usually received the greater attention.

Phosphorus necrosis, itself, the peculiar local form of the disease, is caused by the absorption of phosphorus through the teeth or gums. The generally accepted theory is that minute particles of the poison enter, for example, through the cavities of decayed teeth, setting up an inflamation which, if not quickly arrested, extends along the jaw killing the teeth and bones. The gums become swollen and purple, the teeth loosen and drop out, and the jaw bones slowly decompose and pass away in the form of nauseating pus which sometimes breaks through the neck in the form of an abscess or if not almost continually washed out, oozes into the mouth where it mixes with the saliva and is swallowed.

Treatment is largely preventive, but when the disease is once established a serious surgical operation is often the only means of arresting the process of decay. In many instances in this country it has been necessary to remove an entire jaw, and in several cases both jaws have been removed at a single operation. The awfulness of this trouble and the ease with which it can be prevented have led many countries more advanced in labor legislation than our own, to do away with the disease forever.

In all American match factories the head of the ordinary parlor match is made by dipping that end of the wooden splint into a paste containing white phosphorus. This variety of phosphorus is a deadly poison and a very small amount is sufficient to cause death. The accidental poisoning of young children who innocently such off the heads of these ordinary matches and a few hours later die in terrible agony, is not uncommon. Intentional poisoning among women for criminal purposes is probably much less common, but records of occasional fatal cases of such criminal use of the white phosphorus extracted from matches, is sufficient to demonstrate the unwisdom of thus providing such a poison in convenient form. Accidental and intentional poisoning, however, need not especially concern us here. We are interested in the far more important aspect of the question—chronic industrial phosphorus poisoning among those directly engaged in the manufacture of matches.

Although complicated by modern methods and machines, the fundamental processes in the manufacture of matches may be described in a few words. The wooden match splint is prepared; the composition for the head of the match is mixed; one end of the splint is dipped into this paste; the "green" match is allowed to dry; and finally it is boxed and wrapped.

The processes which are especially dangerous in this industry are all those which bring the employee within range of the poisonous phosphorus. Imperfect ventilation in the mixing, dipping, drying and packing rooms increases the danger by forcing the workers to breathe the fumes of phosphorus. Particles of phosphorus are also likely to become attached to the hands of the workers and later be transferred to their mouths.

During the year 1909, detailed reports were secured for 3383 employees in fifteen different match factories in the United States and it was found that 65 per cent were working under conditions exposing them to the dangers of phosphorus poisoning. The women and children were much more exposed than the men. Ninety-five per cent of the women and 83 per cent of the children under sixteen years of age were exposed. The fifteen factories investigated, according to statements by the manufacturers, employed 3591 persons, of whom 2024 were men, and 1253 were women 16 years of age and over. Children under 16 numbered 314—121 boys and 193 girls.

Sixteen cases of phosphorus poisoning were discovered by special agents of the Government who visited these fifteen factories and talked with the factory managers. An intensive investigation by the writer in the homes of the work people of but three of these factories yielded a total of 82 cases. In two factories at least 8 perfectly authenticated serious cases are known to have occurred during the year 1909, and references have been found to several more. The records of more than 100 cases of the disease were discovered by the writer of this paper within a very short time, though it has been the claim of the match manufacturers and there is a popular impression that the trouble has not existed in a serious form in this country for twenty years. In one of the most modern establishments owned by a leading match company since 1880, records of 40 cases of phosphorus poisoning were secured. Of this number 15 resulted in permanent deformity through the loss of one or both jaws, and several cases resulted in death.

Upon every possible occasion, however, we need to emphasize the fact that the number of deaths, and, in fact, the number of cases of any occupational disease, as actually *reported* is no sufficient criterion for judgment as to the seriousness of that disease. Under the English system of compulsory reporting, which is far superior to anything we have in this country, it is frankly admitted that many cases of industrial poisoning escape record and that, unfortunately, some have been concealed. Even in our own bureaus of vital statistics this lack of sufficient record is notably true. In looking up the official records of a recent death from phosphorus necrosis, for instance, I found the real cause was given on the death certificate as merely "contributory," and the primary cause as "general debility." "Phossy jaw" escaped with scant notice, while an overflowing share of credit was given to our old enemy "General Debility."

In Europe, for seventy years and more, the effect of white phosphorus upon the health of workers in match factories has been recognized as a serious problem. One country after another has attempted to minimize the poisonous effects of the phosphorus by strict government regulations. The regulations have included such provisions as medical and dental inspection at the expense of the employer, factories built according to architectural plans furnished by the government, and separate dressing rooms, wash rooms, lunch rooms, with mouth wash and soap and towels furnished by the employer. The hours of labor were also strictly regulated and women and children were rigidly excluded from many departments. The percentage of phosphorus in the paste was limited until many manufacturers rebelled and made matches in defiance of the laws. Notices warning employees of the dangers involved in the handling of phosphorus matches were posted, and employers were required to read the warning to their employees at stated intervals. Partly as a result of these extraordinary and expensive precautions the industry was rapidly concentrated in the hands of a comparatively few employers, and conditions were improved. But so serious was the effect of poisonous phosphorus, even under such careful and expensive regulations, that within the last few years the leading countries of Europe have abandoned the attempt to regulate, and have prohibited absolutely the use of this dangerous element in the manufacture of matches.

For this poison a harmless substitute that is commercially practicable, is readily available in a substance known as sesqui-sulphide of phosphorus. The immediate conditions which brought about the discovery of this substitute, are both interesting and instructive. It was discovered in France, where the manufacture of matches is a government monopoly, and where under a system of State compensation for injuries received in the course of employment, the expense due to cases of phosphorus poisoning was readily apparent.

Manufacturers in one country after another, however, have complained, since the substitute is a very little more expensive than the poison, that they could not adopt its use until other countries did likewise. A few countries, having little or no export trade, adopted prohibitive measures, but the most important industrial states still refused on the plea that it would drive their industries away.

Fortunately, in 1900, the International Association for Labor Legislation was organized to deal with questions of this kind. It established a scientific bureau in one of the government buildings in Basel, Switzerland, and went to work on the problem of securing greater care and greater uniformity in labor legislation. In 1904, it called, in coöperation with the Swiss government, an international conference with the hope of securing the abolition of poisonous phosphorus by international agreement. As early as 1906 the governments of France, Italy, Denmark, Luxemburg, Switzerland, the Netherlands and the German Empire, signed a convention agreeing to prohibit the manufacture, sale, importation or exportation of poisonous phosphorus matches. In 1908, Great Britain, and in 1909, Austria, by Parliamentary Act established the same principle, and now no less than nine of the leading governments of Europe have signed the treaty. The industrial disease due to phosphorus poisoning in the manufacture of matches is rapidly disappearing in Europe and within a short time Compensation Acts abroad may drop "phossy jaw" from the list of injuries received in the course of employment.

In the United States "phossy jaw" has afflicted workers in match factories since 1850. In 1906 the American section of the Association for Labor Legislation was organized, and when it began its investigation two years ago, no systematic study of the disease had ever been made in this country. Through the coöperation of the United States Bureau of Labor, which became interested at about the same time, we now have in Bulletin No. 86, (January, 1910) a detailed report of this investigation. As a direct result of this investigation conditions have been improved, and it is announced that the harmless substitute will soon be used, but absolute prohibition of the use of poisonous phosphorus by effective legislation is the only safe and sure remedy.

Our American manufacturers, while admitting that the harmless substitute for poisonous phosphorus would make the manufacturers' cost of matches less than five per cent more, declare that its voluntary use would place them at too great a disadvantage with business competitors. Written statements, however, have now been given to the government by our leading manufacturing companies which together produce probably as much as 95 per cent of the total product, promising to discontinue the use of the poison as soon as a uniform prohibitive regulation can be secured. Objection has been raised by the manufacturers to any plan to regulate through the individual State legislatures, on the ground that such measures would not be uniform in application and that it would drive the industry from their states. After careful study, therefore, the Association for Labor Legislation has determined to secure uniform protection to all by securing national legislation on the subject, and a bill to accomplish this purpose was introduced in Congress on the second day of June, 1910.

Approaching the question from the selfish standpoint, even, all classes are substantially benefited by conditions which promote the health, vitality, energy, and industrial efficiency of wage earners. Every effort, then, to promote the coöperation of all forces interested in the improvement of physical and industrial efficiency of the working people and to eliminate occupational disease, should meet with the encouragement of all classes. And to the support of no movement should that common encouragement come more willingly and surely than to the campaign for the elimination of occupational disease. For those producers, who, in addition to the ordinary chances of industrial hardship, are forced to handle perilous material and work in constant risk of doom, there should be ready sympathy and quick relief.

In the match industry there is an occupational disease which without great expense, without a long struggle against poverty, indifference, ignorance and neglect, may be absolutely eliminated by a simple act of the national government. Wherever special study has been made of phosphorus poisoning, the malady has been found to exist in serious form. It has existed, moreover, year after year in some factories during all of the past generation, and in spite of modern attempts on the part of the most intelligent and humane employers to minimize and regulate, it still exists and claims its victims one by one. When everything is considered, it appears almost criminal to foster longer the use of a poison for which there is a harmless substitute, particularly when by acting in harmony with the most advanced countries of the world we can save the manufacturers the annoyance of expensive and arduous precautions, protect the workers from disease, horrible deformity and death, save the general public from additional accidental poisoning and convenient instruments of crime, free ourselves from the burden of supporting those who are incapacitated by the peculiar hazards of the industry, and finally, ***absolutely eliminate this occupational disease.***

ILLINOIS COMMISSION ON OCCUPATIONAL DISEASES.

CHARLES R. HENDERSON.

I. Origin.

The Illinois Commission on Workingmen's Insurance in 1907 said in its report to the Governor and Legislature:

"Undoubtedly the time is not distant when industrial states must take up the problem of legislation upon sickness insurance. To provide a scientific basis for such legislation we recommend the appointment of a competent commission having the power and the means to make a thorough study of the kinds, causes and extent of diseases among workpeople, and the most modern methods of protection, prevention and insurance."—Report of the Industrial Insurance Commission (1907).

This suggestion was accepted by the legislature and a joint resolution was passed in March, 1907, which created a commission on Occupational Diseases:

"The Governor is hereby authorized and requested to appoint a Commission of nine members . . . who shall serve without remuneration and whose duties shall be to thoroughly investigate causes and conditions relating to diseases in occupations, and to report to the Governor the draft of any desirable bill or bills, designed to meet the purposes authorized in this Resolution."—House Joint Resolution, No. 16, 1907.

Governor Deneen appointed the following persons members of this Commission: Dr. Geo. W. Webster; Charles Richmond Henderson; Edgar T. Davies, Chief Department of Factory Inspection; Ludwig Hektoen, M.D.; Arnold P. Klebs, M.D.; James Simpson, Vice-President Marshall Field & Co.; James A. Egan, M.D., Secretary Illinois State Board of Health; David Ross, Secretary Bureau of Labor Statistics; and Miss Alice Hamilton, M.D. Afterward Dr. Kelbs resigned on account of absence from the country, and still later Dr. Hamilton resigned in order to accept the position of Special Medical Investigator for the Commission.

Their places were filled by Governor Deneen by the appointment of Dr. W. H. Allport and Dr. Walter S. Haines. The Commission organized by the election of Dr. G. W. Webster as President, Mr. E. T. Davies as Treasurer and C. R. Henderson as Secretary.

II. Plan.

At a meeting of the Commission held September 21, 1909, the Commission accepted the outline of a plan for the investigation. Owing to various complications relating to the appropriation bill, the Commission could not actually begin its work until the early part of the spring of 1910. Dr. Hamilton entered upon her duties as Medical Investigator March 1, 1910. The Secretary had been collecting materials for several years.

The original plan adopted by the Commission included the following essential points:

1. The *scope* of the investigation was determined by giving a somewhat large definition to the terms "occupational diseases". Since the available fund was limited and the time left was very short, it was at once decided to restrict the scope of the investigation to one point, which was selected upon expert advice. At the same time the Commission was obliged, by the terms of the joint resolution and the expectation of the public, to give some consideration to other aspects of the problem, especially as it was hoped the study would be followed up by a permanent Commission or Bureau through later action of the Legislature.

2. The *general purpose* of the Commission, looking to the long future, was:

(a) To discover the *facts* in relation to the diseases of workingmen in the industries of Illinois and to trace them to the conditions which produce or aggravate them, especially where these conditions are found in the places of work. It is also believed that other conditions surrounding the workpeople should also be studied with reference to their health and industrial efficiency.

(b) While the investigation of causes is proceeding there is a parallel study of the methods of *prevention* of such diseases, already invented and used with advantage in this country and abroad. Within our limited time only the methods in use in a very restricted field can come under our notice.

(c) We had, even before the appointment of the Commission, been collecting, translating and arranging laws of the most advanced nations and states, and the regulations of the best employers relating to some of the dangers to which workpeople are exposed. This study has been continued, and now the coöperation of the American Association for Labor Legislation and the Bureau of Labor at Washington promise to make our local studies far more helpful to our Legislature.

(d) The joint resolution of the Legislature requires us to give consideration not only to methods of prevention but also to the best methods of sickness insurance, in view of the fact that in English legislation a considerable number of occupational diseases are included in the compulsory compensation law. It is quite certain that some such legislation will be proposed in this country in the near future, since an "injury" may quite as truly arise from a disease as from a wound. The subject of prevention is closely connected with that of compensation or insurance, as experience has already demonstrated. Indeed it is easy to show that a proper organization of sickness insurance would directly lead to the most effective methods of prevention.

(e) The joint resolution of the Legislature creating the Commission requires us to make a report to the Governor and the Legislature and to offer drafts of bills, if possible, in order to put our practical recommendations into the form of law.

(f) The Commission also proposes to draw up rules, regulations, warnings and instructions for workingmen, foremen, superintendents and employers. Very frequently disease and death are caused by the ignorance of both employers and workmen. What seems sheer recklessness is likely to be the result of ignorance, and the instructions which are used in Europe must be re-edited to fit the conditions of American methods of manufacture. They cannot therefore be intelligently drawn up until we have thoroughly investigated the processes of manufacture actually employed in the state of Illinois.

It was already understood by the Commission that only a small part of even this restricted program can be carried out before January 1911, when our report must be made and when the legal life of the Commission will cease. All we can hope to do, therefore, is to give a definite description of a limited number of industries, and the dangers to health which we have discovered, and show to the Legislature the vastness and complexity of our inquiry and the necessity of further study with ample means and time.

III. Procedure.

Division of Labor. The Commission in accordance with its first plan has appointed Dr. Alice Hamilton to make a special investigation of lead-poisoning in this state, and she will be assisted by as many other investigators as can profitably be employed up to the time when the materials for the report must be collected. She will also go to the Brussels Congress to represent the Commission and to secure all possible information and wisdom from that assembly of experts.

The Secretary of the Commission is arranging the information in regard to the industries of the state, the laws of various countries bearing upon the subject under inquiry, the regulations introduced by insurance companies and employers to prevent disease.

Sources of Knowledge. For information we depend first of all upon a personal examination of workplaces by medical inspectors. This investigation bears upon the nature of the

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process, the machinery used and the points at which the workingmen are exposed to industrial poisons. Careful notes are taken of the provisions made for diminishing danger and preventing sickness. The inquiry is extended to employers, workingmen, and their families, local physicians, insurance companies and their physicians, coroners, factory inspectors and records of hospitals.

Utilizing former Studies. Wherever it is possible the Illinois Commission will utilize the labors of others who have made contributions to knowledge in this field. Thus the American Association for Labor Legislation has already collected and translated much material in regard to laws on health and comfort, also Dr. Andrews' study of phosphorus will be a substantial addition to our knowledge of one danger to which Illinois is exposed. This will greatly abbreviate the labors of our Commission and make their report more valuable to the Legislature. In a similar way the Bureau of Labor at Washington has offered to do all in its power to give us assistance, and we have a thoroughly good understanding with both. Correspondence with trade unions and fraternal societies promises to give some hints and results, but the most telling facts must be discovered by direct examination of the workplaces in our own state. Very little attention is given by practical men to descriptions of conditions, and to recommendations for preventive methods or laws imported from the other side of the Atlantic, and whatever the Commission itself may learn must be interpreted in the light of a thorough going study of local conditions, for no one can tell in advance of this local observation whether the conditions and methods of England or Germany and the regulations suitable there would have any significance here.

The publications of the Commission will naturally follow the investigations. Their particular form and content cannot be determined before the autumn when a mass of facts will be brought together. By the terms of its appointment the commission must, as already shown, make report to the

Legislature. Naturally different members of the Commission, and especially the chief medical investigator, will desire to present descriptions in scientific journals as the result of their studies, to add to knowledge and to secure intelligent criticism and interpretation.

The special field of investigation this year is lead poisoning in Illinois, as already indicated. This Conference will hear a paper by Dr. Alice Hamilton on this subject and it is therefore unnecessary for me to do more than state the general purpose of the Commission. We confidently hope from the observation of the investigators to give a careful and accurate description of the conditions in our industries which lead to lead poisoning. While we cannot hope to give a statistical exhibit of all the cases of lead poisoning, it is already evident that we are dealing with a very serious danger and that much can be done to mitigate these perils, if not to remove them altogether.

IV. Exploration for Other Diseases.

While the attention and labor of the Commission will be concentrated upon the investigation of lead poisoning, we shall respond as far as possible to a demand from many of our fellow citizens to give some attention to other dangers to health. In the very process of investigating lead poisoning other sources of injury will come to our knowledge and will be recorded; and this attention to other evils will in no way interfere with the main inquiry.

1. Dr. Hektoen has secured an investigation of caisson disease in tunnel work in Chicago. While this malady does not affect a very large number of persons it is sufficiently serious to receive attention. The best methods of avoiding danger will also be studied.

2. Two specialists under the particular attention of Dr. Hektoen will inquire into the conditions of the life of coal miners in our state and endeavor to discover how far the disease of *nystagmus* exists among miners. The facts are not generally known, but there are indications of its exist-

ence which place the Commission under obligation to make some inquiries and report the facts. Possibly during this inquiry other difficulties of miners will come to light and call for further study.

3. It is hoped also to bring together information in regard to injuries to the eyes and nervous system of workmen from the glare and heat in connection with certain steel industries and work on locomotive engines. Dr. Walter H. Allport has been asked to employ assistants and direct exploration in this field for the Commission. He may make some inquiries about eye-strain and injury to the organs of hearing.

4. Dr. Walter S. Haines, another member of the Commission, has become interested in an inquiry in relation to certain forms of gas poisoning in connection with metal work, and he is authorized to secure investigators and supervise their studies in this field.

5. Another line of inquiry will relate to the effect of overwork and prolonged hours. It is not intended to make laboratory experiments in respect to fatigue, but it does seem desirable to bring together the results of observation and experience upon effects of prolonged exertion in connection with a great many industries. It is hoped that by classifying all the numerous facts found in the reports of specialists, in the statutes and factory laws, trade union regulations and agreements, we may to some extent help to establish more exact standards of hours and proper rest periods in various industries with particular reference to the different needs of men, women and youth. Future legislation on the subject of rest will require knowledge on these various heads.

V. Results.

It is manifestly impossible for us to report at this early date any final results of our investigations, but we can already see that in one field at least our services are appreciated. Already representatives of the trade unions have preferred requests that we furnish them brief, plain, practical directions for the working men in different trades so that they may be able to avoid disease. Employers also begin to see that we are not making an attack upon them, but that we are in a postition to render them valuable service. In one important instance at least our chief Medical Investigator has been requested by an important corporation to give them information and advice in respect to better methods of guarding the health of their employes; and in another instance one of our investigators, who is expert in the matter of machinery, volunteered a suggestion for the better protection of workingmen in a certain establishment, and within two days his suggestions were acted upon by the Company. It is hoped that this spirit of frank and open coöperation will characterize the study throughout. Certainly the desire of the Commission is first to save workingmen themselves from disease, suffering, pecuniary loss and death, and in the second place it is its desire to coöperate with employers to render their human instruments of production more capable, efficient and steady in their application to the productive processes. While there are, of course, points of conflict in the relation between managers of industry and the operatives, there is in the last analysis a profound harmony of interests. The health of the workingmen is an asset to the employer of labor. Sickness brings with it feebleness, inefficiency, irregularity and unreliability of the employes, and therefore anything that can be done to maintain regularly at their highest point of efficiency the health and energy of the workingmen is a direct contribution to the profit fund of the employers. Money wisely and carefully spent in protecting workingmen is not a burden on capital but a prolific investment, and we already see that most of the employers are capable of taking this view of the subject. We have thus far not had any occasion to use our legal power of entrance to secure reliable information. Upon proper representation of our authority, our agents have usually been politely received and facilities given them for examination and reports.

LEAD POISONING IN ILLINOIS.

ALICE HAMILTON.

Dr. Henderson has outlined the plan of work undertaken by the Commission in respect to the trades where lead is used. This work has been in progress now for a little over three months and we have investigated perhaps one half of these trades. One can gain an idea of the wide use of lead in manufacturing from this list of the different industries in which we have already discovered cases of lead-poisoning.

Lead-smelting.
Manufacture of lead-pipe, sheet-lead, alloy, etc.
“ “ White Lead, Old Dutch Process.
“ “ “ “ Carter Process.
“ “ Red Lead and Litharge.
“ “ Leaden Car-Seals.
“ “ Dry Colors.
“ “ Mixed Paints.
“ “ Fine grades of Putty.
“ “ Sanitary Supplies.
“ “ Storage Batteries.
“ “ Coffins.
“ “ Litho-transfers.
“ “ Picture Frames.
Painting: Houses.
“ Carriages and Automobiles.
“ Agricultural Implements.
“ Railway-cars and Street-cars.
Printing.
Stereotyping.
Mechanical Artists’ Work.
Stencilling Sofa Pillows.
Wrapping Cigars in Tin-foil.
Labelling Paint Cans.
Manufacturing Wall-paper.
Selling Wall-paper.
Sorting and Melting Metal in Junk Shops.

Besides these, white and red lead are used in the manufacture of glass, pottery, certain kinds of paper and india-rubber, and metallic lead is used in the plumber's trade, in tin-smithing, in harness making and to a minor extent in many other trades.

The method we have followed to obtain information concerning these trades and the poisoning incident to them has been described by Mr. Henderson,—the inspection of actual conditions in the factories and the search of hospital and dispensary records, the interviews with physicians, workmen, trade unions and mutual benefit associations.

I might summarize our results thus far by saying that we have found cases of lead-poisoning among the workers in 33 of the 56 establishments thus far studied. Of the 23 in which no cases have yet been found, only six are large enough to employ more than 12 men in the lead work; the rest are small establishments. In addition to the 33 which we have personally inspected ,we have found 20 other places in which lead-poisoning was contracted, making so far 53 work-shops where lead-poisoning prevails among the workers.

One hundred and thirty-five cases occurring during the last three years have been reported to us by name, all of which had a physician's diagnosis of lead-poisoning. And in addition physicians living near some of the larger lead-smelting works, white lead works, metal works and dry color works have reported their yearly average of cases, which mounts up to 665.

This last figure of course must be taken with great caution. Many lead-poisoned men consult more than one physician and thus would be counted more than once. On the other hand, we have never succeeded in interviewing all of the doctors in any neighborhood, and in Chicago the employees are so scattered that it is very hard to find any doctors to interview. The places inspected are chiefly in Chicago, with four from East St. Louis, Collinsville, Alton and Granite City.

As to the comparative danger of the trades we have studied, I should say that the most dangerous were lead-smelting and the making of white lead, although the litho-transfer work, the dry color work and the making of storage batteries come very close to them. The painting trade yields the largest number of victims, especially if we add to ordinary painters the so-called mechanical artists who use white lead for retouching advertisements. But that is because this is numerically the largest of the lead trades. There is not as much acute lead-poisoning in this trade in proportion to the workers as in the others mentioned. Nor are the effects of the poison as rapid in painters as in workers in certain other trades. The painters themselves tell us that a man rarely develops symptoms under five years' exposure, and many on our list have worked 15 or 20 years before feeling more than passing discomfort from the lead, while one worker in storage batteries was violently ill at the end of ten days and according to the statements of physicians, many men are taken with serious symptoms of lead-poisoning after six weeks exposure in lead-smelting or white lead works. On the other hand the most serious cases we have found have been among painters, probably because this is a skilled, well-organized and well-paid trade and a man is loath to abandon it before he is absolutely crippled.

Perhaps it would be well to give a short description of the typical symptoms of lead-poisoning. An acute attack is preceded by loss of appetite, general feeling of ill-health, foul breath, a bad taste in the mouth, obstinate constipation. The attack itself usually consists in paroxysms of agonizing colic, with vomiting and constipation, more rarely diarrhoea. This is accompanied by great restlessness, but no fever. Usually the first attack passes over without leaving perceptible traces, but if the man goes back to his work he probably has repeated attacks and develops the so-called "lead cachexia". He is extremely pale, has a poor appetite, is constipated and suffers from indigestion, from gouty or rheumatic pains and swelling of the joints. The nervous system becomes affected and he develops partial paralysis of the wrists, shoulders or ankles. There is a progressive hardening of the blood-vessels, causing premature aging, injury to the heart, kidneys and liver. Paralysis or insanity may come on as a result of lead-poisoning. Death may result from acute poisoning but is more frequently due to the secondary effects of the lead, to kidney or heart disease or apoplexy. Or the lead-poisoning may so lower the general health that the man succombs to some intercurrent affection. Women are especially susceptible to lead-poisoning and are more prone to develop severe nervous symptoms.

It is characteristic of this form of poisoning that it is slowly cumulative. Even minute doses, not more than 1/6 of a grain a day, if repeated again and again, will produce the typical symptoms. Usually the poison is absorbed through swallowing, the dust gaining entrance to the mouth by inhalation or from unwashed hands, but the fumes of heated lead are also poisonous. Prevention consists in good ventilation and cleanliness of the person and of the premises.

We have found such great difference in the conditions in factories doing the same kinds of work that it would be impossible to make any general statement as to the precautions taken in Illinois to protect the workers in lead. Two factories belonging to the same company will be found at the two extremes as regards cleanliness, use of machinery, solicitude for the health of the men. I have in mind two white lead factories controlled by the same company; one of them is dilapidated, dirty, ill-ventilated, looking as if it had undergone little improvement since 1843 when it was built, the work is largely done by hand, the product is handled most carelessly and there is an apparent indifference toward the workmen on the part of the management. The other is modern, clean, well-ventilated, furnished with machinery wherever it is possible, there are good sanitary provisions for the men, and their welfare is a matter of real interest to the management. Almost as great a contrast is to be seen between two lead-smelting places, operated by the same company. This means, of course that the care of the men depends entirely upon the good will of the man in charge. The two best establishments I have seen, the most nearly model places, are operated by their owners, men who have grown up in the trade, know it thoroughly and have a pride in their plants and a personal acquaintance with their men which lead to careful management.

It is rather paradoxical and yet entirely understandable that we have been able to find a larger number of cases of lead-poisoning in the well-managed factories than in those badly managed. In the former the situation is faced frankly, the cases are sought out and treated, in the latter the dangers are ignored or minimized, and there is no effort to discover cases of poisoning, rather the contrary.

The lead trades here differ from the same trades in Europe in several ways, two of which are the non-employment of women and the shifting class of labor. Only one trade thus far studied, the litho-transfer work, employs women to any great extent. This is a distinct advantage for our side. As to the other I do not know whether it is an advantage or not to have a large body of men moving in and out of the smelting-works, lead pipe works and white lead factories, staying from a month to a year and dropping out as soon as they are leaded. It is true that the individual worker does not suffer as serious damage as in the old countries where work is not so abundant and a man must stick to his job, even if it makes him ill, but on the other hand there is a much larger number of men exposed to lead-poisoning. One smelting-works with a pay-roll of 600 reports that at each pay day, that is every two weeks, they lose from 5% to 50% of their men, and must send beforehand to the big cities for gangs of new men. Another smelting plant loses 25% to 30% of the men each month. The foremen in these places tell one that this is due entirely to the character of the help employed, that the men are negroes or Slovaks or Pollacks or Greeks or Dagoes, and by nature unsteady and given to drink, but the men and the physicians say that it is because of the dangerous character of the work and this is apparently borne out by the reports from two white lead works in the same part of the country, both employing colored men. One, the worst factory I have seen, has a pay-roll of only 80, but takes on between 400 and 500 men in the course of the year*. The other, which is the best white lead factory I have seen, has a pay-roll of 143 but takes on only about 80 new men a year. I cannot find any reason for this difference except that in one place the men are taken care of, in the other they are not.

The majority of men employed in lead-smelting and white lead manufacture are unskilled or half-skilled, so that the management does not always make an effort to retain them. There is also reason to believe that some employers do not discourage the continual changing of the working force, feeling that they are thus avoiding severe cases of lead-poisoning. I was told by one manufacturer of white and red lead that there was an advantage in employing colored labor, for the negroes seldom work continuously more than a few months at a time. One red lead factory, not in Illinois, discharges automatically all laborers at the end of three months employment, in order to prevent the more serious forms of plumbism. This very shifting of the working force undoubtedly increases the amount of lead-poisoning, for the casual laborer is more ignorant of precautions than the steady one, he is also more apt to be dirty in his habits and a heavy drinker.

English statistics tell us that out of the whole number of men employed in the white lead industry during one year the incidence of lead-poisoning was only 5% among those regularly employed and 8.3% among the casual workers.

The general tendency in the lead trades is toward improvement in working conditions, not on humanitarian grounds but on economical grounds. The Scotch Hearths with their poisonous fumes are being replaced by far safer smelting processes employing fewer men. The white lead and dry color houses are using more machinery and saving their dust. There is increased machinery in the lead-pipe and sheet lead trades. The litho-transfer work is being done by dustless machines instead of by hand. However, the painters and the storage battery workers have not so far been helped by improvements in their trade.

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* These are, of course, not always new men, some are old employees returning to work after longer or shorter absences.

It is of course, far better that the improvements should come in response to the demands of economical management, not of philanthropy, for they are on a much surer basis, and it is to be hoped that there will be a growing recognition of the value of what one manufacturer calls "experienced, unskilled labor" so that it will be recognized as worth the effort to keep a steady force of workmen.

The regular medical inspection of the men, which is required by law in most European countries, is very rare here. One of our 56 factories has regular inspection, two others employ a physician to attend the men when they are sick. In two more the foreman claims to be able to recognize cases of lead-poisoning and to treat them with success. But as a rule the leaded workman drops out temporarily, coming back to work after the attack is over or after a few months at another trade, or else he leaves the work altogether and his place is taken by another.

PROBLEM AND EXTENT OF INDUSTRIAL DISEASES.

FREDERICK L. HOFFMAN.

The health and longevity of industrial workers is a matter of increasing and serious concern to wage-earners, employers, and the State. It requires no extended analysis of the statistical and related facts to prove that in many industries the health conditions are far from satisfactory and that the resulting sickness and death rates are excessive. The evidence is entirely conclusive that by ameliorating existing conditions and by removing predisposing or accelerating causes the health and longevity of industrial workers can be materially improved. Commendable progress has been made in this direction in the last quarter-century, and both the mortality and morbidity rates in many trades have declined. The statistical proof of this assertion is derived almost exclusively from foreign data, since corresponding investigations have not heretofore been made on an extensive scale in the United States.

The whole subject of occupational diseases is rather new in this country, and broadly speaking no very serious effects of industry have generally been observed except in the case of a comparatively small number of particular trades. In most of these the unfavorable effects of industry on health have been held to be inseparable from industrial processes required for the needs of the community at large. Trades of this kind are, the manufacture of pottery, the making of glass, the making of hats, the manufacture of matches, etc. In a few cases qualified medical men of ability have devoted their talents to research after more or less obscure causes responsible for the observed departure in the morbidity and mortality of workmen from the normal incident to occupations at large. Inquiries of this kind have been hampered by the absence of satisfactory standards of life and health and of normal physical capacity and adaptability to industrial trades. All such investigations are more or less impaired by the subtle effects of occupation selection, which attracts the most healthy to some employments, while the least healthy, or those already predisposed to diseases, often follow occupations unsiuted to their physique. Under such circumstances it is difficult to define with scientific accuracy the term "industrial disease," but the difficulty is less serious in the case of industrial accidents.

How far an excessive mortality, or high rate of mortality, is the result of unfavorable conditions inherent in industrial employment, can only be determined by qualified inquiry into the actually existing conditions. Occupational diseases may be broadly defined as morbid results of occupational activity traceable to specific causes and followed by more or less extended incapacity for work. It must be admitted, however, that specific occupational diseases are of comparatively rare occurrence and that the problem is rather one of determining increased morbidity and mortality from general causes among workers in specialized trades.

Mortality rates indicate only approximately the effect of specific employments or industries, since by our more or less crude method of death certification and statistical analysis the predisposing causes are not brought to light. This is true, for illustration, of metallic poisons, which impair the digestive function and in which the resulting death is usually diagnosed in general terms instead of being properly attributed to predisposing occupation conditions. This is even more true of industrial dust, which enormously increases the mortality from tuberculosis and lung diseases generally. No medical practitioner would, without special inquiry, be justified in attributing deaths from tuberculosis in dusty trades to the employment and they are, therefore, diagnosed and recorded as having been due to a general disease.

At the outset of an inquiry of this kind it is necessary to agree upon a normal standard of morbidity and mortality by which the detrimental effects of certain trades shall be measured with at least approximate accuracy. European investigations into industrial sickness and accident experience would seem to warrant the theoretical assumption that among an industrial population of ages 15 and over, of both sexes, but in the proportion of two males to one female, and engaged in miscellaneous trades and not exclusively in hazardous trades, there will occur 50 cases of sickness per 100 persons employed per annum, and of this number five cases will be the result of industrial accidents. There will occur approximately 1,000 days of sickness per annum, or ten days per employee, and of this number, one day will be the result of industrial accidents. The mortality rate will be approximately 10 per 1,000 per annum. This standard, of course, will vary according to the age distribution of industrial workers, and the results will probably be less for a country like the United States, where a considerable proportion of the workers are of an age below 40.

The number of days of sickness under normal conditions has a tendency to gradually increase, and in the Leipzig sickness experiences, for illustration, there were about six days of sickness per member per annum at ages under 15, increasing to about 9.5 days at ages 35-39, 21 days at ages 60-64, and 40 days at 75 and over. In calculating, therefore, the rate of sickness among members of specialized trades, it is absolutely necessary to take the age factor into account.

European sickness statistics depend very largely upon the financial considerations which enter into the compulsory or voluntary sickness insurance agreements. Most of the sickness is of comparatively short duration, but the financial results of sickness insurance are very seriously affected by the duration of sickness for which allowances are paid. It is equally true that where the initial benefit of sickness allowance does not commence until after a stated period, say three days, or seven days, a large amount of sickness may remain unrecorded or unregistered because of the fact that the occurrence of such sickness does not enter into the financial calculation of the sickness fund. As yet no conclusive general investigation has been made to determine the absolutely true and complete amount of sickness among the general population, with a due regard to age, sex and occupation. Investigations of this kind which have been made in connection with the census of New South Wales have yielded defective results on account of imperfect methods of sickness enumeration. The technical and practical difficulties of an investigation to determine the actual amount of sickness among a whole population are such as to make it seem inadvisable to undertake inquiries of this kind.

The four factors which enter into sickness occurrence are: (1) the degree of sickness frequency as measured by the number exposed to risk, with a proper differentiation as to age, sex and occupation, the causes of disease, and the nature of industrial accidents. Acocrding to the Leipzig experience about 40 per cent. of the membership of a sickness fund may be expected to suffer from diseases or accidents combined, and of this proportion 8 per cent. will be the result of industrial accidents alone. (2) The second factor is the number of cases of sickness per person, and as has been determined from the statistics of Austria the ratio is 1.2 per cent., or say 12 cases of sickness to every 10 persons insured one year. (3) The third factor is the duration of sickness, or the number of days of sickness per case, which by German statistics is approximately 22 days for which financial liability had to be met. Since most of the German sickness funds do not grant benefits for more than twenty-six weeks sickness duration, the returns are somewhat affected by this qualification. (4) The fourth factor is the probability of sickness, or the days of sickness per annum per member, and according to the Leipzig returns this figure is approximately 8.6; that is to say, during every year on an average there will be nine days of sickness to every person insured under a sickness fund granting sickness benefits of variable duration, but, as a rule not in excess of twenty-six weeks.

As previously stated, these averages are subject to material modification according to the age, sex, and occupation of special classes, and the more or less health-injurious effects of certain trades can be measured with approximate accuracy by the departure from normal standards of sickness occurrence.

The materials available for investigations of this kind in the United States are at present very limited. A number of long established labor organizations, both national and local, afford, however, an opportunity for qualified research if the records were made available for that purpose. It is understood that the National Bureau of Labor has in contemplation the early publication of a number of investigations of this kind, and it is to be hoped that this intention will be carried into effect. There unfortunately has been great general disregard of the age factor in the recorded sickness experience, and mere aggregations of sickness occurrences, without reference to age, are of comparatively limited practical value. It requires further to be emphasized, however, that the publication of results of this nature should include a statement of the causes of sickness, and that proper medical skill should be employed in the correct interpretation of the death certificates, with due regard to secondary or predisposing causes, which, under given conditions, are of far greater significance for purposes of industrial hygiene than the immediate cause of death, as a rule described in general terms.

Qualified investigations have now quite conclusively established the special disease incidence in particular health-injurious trades. Standard works on occupation mortality, particularly Arlidge and Oliver, furnish a satisfactory basis for preliminary research work to determine the general expediency of special inquiries. The English occupation investigations have had reference, however, to mortality rather than morbidity, since in England occupation morbidity statistics are available for only a few trades, or in a more or less general form as the result of Friendly Societies' experience. On the Continent, however, and particularly in

Germany, the sickness experience of particular trades has been under extensive observation for a long period of years, and the results have been of great practical significance and an important aid in a more qualified determination of causes and conditions more or less responsible for industrial ill-health.

It may be accepted as a fundamental principle that morbidity and mortality vary considerably in different trades and in differential proportions, so that a trade with a high mortality may be one with a low morbidity, while vice versa a trade with a high morbidity may be an occupation with a low death rate. In fact no general rule can be followed and each trade requires to be separately investigated and the facts in each case demand to be considered with utmost care. The most serious impairment of all statistical investigations of this kind results from the effect of occupation selection, or the elimination of those who have been impaired as the result of occupational activity in unhealthful trades and who subsequently find employment elsewhere. The tendency of modern times is rather to increase this impairment of statistical investigation into morbidity and mortality because increasing intelligence on the part of industrial workers suggests, at an earlier date than formerly, a change of employment for the purpose of physical betterment.

Investigations into trade mortality and morbidity are best made by local medical practitioners thoroughly familiar with individual occurrences in which the cause and effect of occupational diseases can be traced with at least reasonable accuracy. The tendencies of industries to be centralized and segregated, aids investigations of this kind by increasing the number of cases available for study and observation. Medical practitioners in industrial centers will realize in course of time, if not now, the great practical advantages of a thorough knowledge of the diseases of the occupations chiefly followed in their particular locality. Many effects of labor are, of course, quite general and the facts are entirely conclusive that indoor employments are, other things equal, more injurious to health than outdoor labor, which, broadly speaking, may be considered a standard both of morbidity and mortality, although there are some exceptions to this rule. The enormous German literature on the subject of occupational diseases by qualified medical practitioners proves conclusively the practical value of special effort in a field than which from an humanitarian and economic point of view there can be none more promising of useful and far-reaching results. As yet, however, in this country very few physicians have given attention to the diseases of trades, and the American literature of occupational diseases is extremely limited.

One most promising field entitled to special mention is the health of the mining population, which has practically received no attention whatever in the United States. Most of what has been written on the health of underground workers has not been sustained by trustworthy statistical data and the more or less decidedly unsanitary conditions underground have not even been referred to. The serious possibility that these conditions have a direct relation to the mortality from certain transmissible diseases, of which typhoid and *ankylostomiasis* may be mentioned as perhaps the most significant, emphasizes the importance of qualified medical attention to investigations of this kind.

While it is an open question whether the dust in coal mines is really prejudicial to health, it can not be denied that there is much theoretical ground for supposing that this is the case. It must always be taken into consideration that the apparently low mortality from consumption among coal miners is in part due to the fact that at the age period when a considerable proportion of the miners would be most liable to this disease the occurrence of fatal accidents removes many who would otherwise in all probability have died from tuberculosis. It must also be considered that the mortality from respiratory diseases of all kinds is invariably high among coal miners and that serious errors may underlie the official diagnosis or that there are other shortcomings in the tabulation and analysis of the causes of death among men employed in this industry.

Whatever doubt may exist with regard to the specific liability of coal miners to tuberculosis or other diseases which are more or less the effect of dust inhalation, there can be no question of doubt as to the decidedly health-injurious consequences of underground rock-drilling and allied occupations in the deep quartz mines of our western states. A report made a few years since upon the health of Cornish miners proves conclusively the direct relation between the inhalation of quartz dust resulting from rock-drilling operations and the extremely high mortality figure from phthisis. That particular investigation may well be considered a model of how similar inquiries should be conducted in this country, not only into the health of miners but of all other industrial workers engaged in more or less health-injurious employments.

It would be a serious error, however, to suppose that all of the health-injurious circumstances of industries are known at the present time. Many industries have never been properly inquired into, and this is true of many indoor employments, particularly stores, offices, laundries, public departments, bakeries, cold-storage rooms, slaughter-houses, etc. The investigation made in England into the mortality and accident liability of men employed in the building trades is another admirable illustration of the methods more or less certain to yield practical results of considerable value. The English investigation into the health of brassworkers is equally suggestive of similar investigations in this country.

The recent and successful investigation by Dr. Andrews into the health conditions in the American match industry, and the occurrence of phosphorus necrosis, as published by the Federal Bureau of Labor, proves that qualified investigations of this kind can be carried out in this country provided they are pursued for the legitimate purpose of ascertaining the truth of actual conditions and not for the unworthy purpose of exaggerating exceptional circumstances for sensational ends.

The death rate prevailing in many occupations is not to be relied on as final and conclusive. An excessive death occupation rate is almost always an indication at least of unfavorable labor conditions, which can only be determined by qualified inquiry and impartial analysis of the available information. The standard which should underlie statistical inquiries of this kind should be the mortality of agricultural and outdoor workers generally. All occupation mortality statistics, however, require to be used with extreme caution, including the statistical results of investigations made by life insurance companies. The census occupation mortality statistics unfortunately are still of very limited value but they are useful for a number of trades which are beyond question subject to conditions more or less detrimental to health. Although most of the census data are admittedly defective they are almost invariably conclusive in the case of trades where for general reasons an excessive mortality from specific causes is anticipated.

For reasons which require not to be discussed, it is often impossible to calculate the rate of mortality on the basis of the number living, but it is practicable and often entirely sufficient to calculate the proportionate mortality from specific causes by differential periods of life. I have made use of this method for many years in my own investigations and the method has now been adopted by the U. S. Census Office in the annual occupation mortality statistics published for the first time in connection with the report on the Mortality of the Registration Area for 1908. Of course this method has its serious limitations but it will emphasize in the case of particular trades the excess in the mortality from specific causes, particularly tuberculosis and industrial accidents.

The practical and determining value of this method can not be denied when it is brought out, for illustration, that at ages 25-34 the proportionate mortality from tuberculosis among compositors, printers and pressmen was 59 per cent. in excess of the average for all specified occupations, and that the corresponding excess for this group of employments at ages 35-44 was 67 per cent., and at ages 45-54, 43 per cent. In a similar manner it is shown that boot and shoe makers; plumbers, gas and steam fitters; bookkeepers, clerks and copyists; tailors; servants; barbers, mill and factory operatives, and many others are occupations subject more or less to an excessive proportionate mortality from tuberculosis of the lungs. To be exact, among bookkeepers and clerks at age 20-24, 42.5 per cent. of all the deaths are from tuberculosis of the lungs; at ages 25-34, 41.9 per cent.; and at ages 35-44, 29.6 per cent. Among barbers and hair-dressers the corresponding proportions were 44.6 per cent. at ages 20-24; 40.1 per cent. at ages 25-34; and 30.1 per cent. at ages 35-44. Among cigar makers and tobacco workers the proportions were 36.4 per cent. at ages 15-19, 35.3 per cent. at ages 20-24, 44.2 per cent at ages 25-34, and 38.8 per cent. at ages 35-44.

Among compositors and printers the proportions were 35.8 per cent. at ages 15-19, 47.5 per cent. at ages 20-24, 49.2 per cent. at ages 25-34, and 40.6 per cent. at ages 35-44. As a further illustration it may be stated that among glass blowers and glass workers the proportion of death from tuberculosis of the lungs at ages 20-24, was 30.4, while among hat and cap makers it was 57.1 per cent. at ages 20-24, 56.8 per cent. at ages 25-34, 35.8 per cent. at ages 35-44, and 23.7 per cent. at ages 45-54. In other words, in all of these trades—and many others could have been named—nearly one-third to one-half of the deaths recorded were due to one specific cause, which by every authority on the subject is held to-day to be a strictly preventable disease.

For the purpose in view, however, it is imperatively necessary to separate the most unhealthful specific employments from the industry as a whole and to determine with approximate accuracy at least, the true incidence of the death rate from tuberculosis in particular employments. In other words, in the glass industry the question which requires to be determined is not so much the healthfulness of the industry as a whole, or the mortality even of particular groups, as the morbidity and mortality of specific employments such as batch wheelers, clay grinders, gatherers, melters, shearers, teasers, etc. In the case of the hat-making industry it is not a question of the industry as a whole but of the morbidity and mortality of specific employments like the following: blockers, blowers, coners, dryers, dyers, feeders, hardeners, mixers, pouncers, etc. In the large group of textile industries it is to small purpose to consolidate the mortality and morbidity under the generic title of mill operatives, which is practically meaningless and obscures the true incidence of disease factors and conditions more or less injurious to health. What is required in this case is to first separate the industry according to the fiber manipulated such as wool, cotton, flax, jute, etc., and then to determine for each group the mortality and morbidity of each specific employment such as loom fixers, openers, mixers, pickers, carders, combers, warp-dressers, nappers, wool sorters, wool scourers, fullers, sizers, slubbers, crabbers, etc.

At the present time most of the mortality statistics in the United States fail to disclose the specific occupation followed, and the term occupation is loosely used, generally with reference to the industry as a whole. The term glass-worker is almost meaningless, while the term glass-blower is specific. The term steelworker is, broadly speaking, of no meaning, while the terms blast-furnace employee, puddler, cupola tender, heater, melter, or Bessemer-blower are well understood and have a definite meaning as far as is possible under the more or less inexact definitions met with in industrial nomenclature.

Upon the same grounds more details are required with regard to the causes of death. As I have emphasized in an address on the Budapest system of death classification, an amplification is necessary to disclose at least the secondary causes resulting in a more or less serious complication of diseases previous to death. While in the five years ending with 1908, 452 deaths from lead poisoning were reported as having occurred in the registration area of the United States, there are strong reasons to believe that the actual number of deaths resulting from exposure to lead in industrial pursuits was very much larger. According to the census about 200 deaths per annum occur in the registration area from other chronic poisonings, but this statement requires to be amplified by a specific return of the various forms of poisoning combined in one aggregate.

It, however, is comparatively rare that deaths from industrial poisoning are reported as such, as for illustration, in the case of lead absorbed into the system and complicating the deaths of painters, or mercury absorbed into the system and complicating the deaths of hatters. Such deaths are seldom returned as having been specifically the result of chronic industrial poisoning, but they are classified under a more general title designating the immediate and not the contributory cause of death. The true facts can only be brought out by the Budapest system of death classification, which should be adopted without delay by the Division of Vital Statistics of the Census, and by registration offices throughout the country generally.

Occupation mortality records, however, have their inherent limitations, and without corresponding morbidity records the facts are often of small value. The recent investigation into occupation mortality and morbidity by the Leipzig Communal Sick Fund brings out very clearly the great practical value of morbidity records, and as a first step in this direction complete employees' accident and sickness registers should be kept by employers in more or less unhealthful and dangerous trades. Such records should contain, in the form of a simple entry, a statement of each employee absent on account of sickness or accident, or injured in the course of his employment, showing at the same time the age, sex, occupation and trade life of the employee, together with an explanation of contributory facts or causes which may possibly connect the employment with the disease or accident experienced. The details of such a plan, however, require to be worked out with considerable care, but if the records are kept in the form of a card index for each employee identically with the method of the Leipzig Communal Sick Fund, or accident, liability and health insurance companies, there would be no difficulty in the future of ascertaining the true amount of sickness experienced in any particular trade, and the collateral causes and conditions having reference thereto.

As a further step, however, towards a rational public hygiene in its relation to industry, there should be a physical examination of entrants into more or less recognizedly unhealthful or dangerous trades or occupations requiring considerable physical strength or bodily resistance to disease, of all persons of both sexes under 21 years of age. The information to be collected by this method, particularly if amplified by a brief anthropometric record of the applicant for employment, would serve a most useful purpose and place the whole question of health in its relation to industry upon a sound and substantial basis of fact, as opposed to most of the present-day guess-work opinion.

As a third need of the present day, the necessity of qualified medical inspectors may be re-emphasized, although it is no longer open to question that medical skill is imperatively required to safeguard the public, the interest of both the employer and the employee against lack of skill, or mere ignorance or indifference, to perform the responsible function of factory inspection in a proper and legitimate manner. The medical function, of course, is separate and distinct, from the technical, and the two should be co-ordinated to the fullest extent to make factory inspection really scientific, rational and conclusive. It requires but a superficial knowledge of the English system of factory inspection to emphasize the practical need of medical aid in this field of social advance, while correspondingly the German system in the field of accident prevention particularly, has demonstrated the great value of qualified technical supervision of industrial processes more or less injurious to the physical well being of the employee.

The argument that rational system of this kind will place intolerable burdens upon industry can not be sustained by an appeal to the facts of European experience, and is easily met by reference to the vast interests involved on the part of both the employers and the employee. The economic value of life and health is no longer questioned by any one thoroughly familiar with the facts, nor is the humanitarian aspect of the subject denied even by those who refuse to sanction the economic defence of the argument. Granting that the statistical basis of estimating the aggregate loss of life and health in American industry is wholly insufficient for a conclusive answer to the question, it is possible to approximately estimate the probable burden which falls upon American wage-earners at the present time. It may be conservatively estimated that in 1910 the number of wage-earners 15 years of age and over, of both sexes, is approximately 33,500,000. Of this number at least 40 per cent. may be estimated to experience during the year more or less incapacity for work as the result of sickness or industrial accidents. Such sickness, however, as a rule, will rarely be of more than twenty-six weeks duration, which is the maximum limit for which allowances are paid in the case of most of the German Government sickness insurance funds. The basis of 40 per cent. has no reference to sickness or accidents of a trivial nature not causing incapacity for work. On the 40 per cent. basis there would therefore occur in American industry approximately 13,400,000 cases of sickness, which under the German system would be compensated for either by a part payment of wages to the employee or his family, or free treatment in hospitals or convalescent homes, including other medical and surgical benefits, etc., which require not to be dealt with in detail.

There are no reasons to suppose that the rate of sickness and accidents among American wage-earners is much less than among German wage-earners, but there are some reasons to believe that on account of a higher accident rate in particularly dangerous industries such as mining, transportation, etc., the actual amount of sickness and accidents causing incapacity for work, and which under the German system would require compensation in some form or other, is possibly greater in the United States than in Germany. The rate differs, of course, according to the two sexes, and it would be approximately 45 per cent. for males and 35 per cent. for females.

On an average there occur in German experience 8.5 days of sickness per annum per person included within the scope of the compulsory sickness funds. Since there are reasons to believe that the duration of sickness in this country would not be less, the figure may be placed at 8.5 days per wage-earner per annum, which when applied to the estimated number of wage-earners in 1910, indicates that there occur at least approximately 284,750,000 days of sickness per annum among the wage-earners of this nation. The duration of sickness among women is usually somewhat higher than among men, and it would probably amount to nine days on the average for males and twelve on the average for females..

The average duration of a case of sickness, according to German experience, is 20 days, or about 19 days for males and 24 for females. Assuming that the duration would be 21 days, or three weeks on the average for the United States, and applying this average duration to the cases of sickness as previously estimated to occur per annum in the United States, there is an estimated total of 281,400,000 days of sickness as determined by a different method but, broadly speaking, upon the same principles.

It is safe to assume that the average loss in wages, making allowance for all contingencies such as unemployment, shamming, voluntary holidays, etc., will not be less than $1.50 per day. Upon that basis the direct monetary loss in diminished wages on account of sickness and accidents in American industries may be conservatively placed at $427,125,000 for the year 1910. To this sum must be added not less than $1 per day on account of sickness expenses, including doctors' bills, medicine, nurse hire, etc., in many cases, and it is more probable that this average cost on this account would be nearer $2 than $1. Using, however, the lowest reasonable estimate, the additional cost on account of sickness and accidents to wage-earners in American industry is $284,750,000 per annum.

But even this is not the total loss, nor is this all. There has been a loss to industry as the result of interference, absence, changes, replacement of efficient workmen by inefficient workmen, waste of time in instruction of new employees to fill the places of those absent on account of sickness or accident—all of which must cause a diminution of the annual output, which also may be conservatively placed at not less than 50 cents a day. It would be absurd to assume that one workman is as good as another, and that the absence of an employee on account of sickness or accident does not involve serious financial loss to the employer, and that loss as measured by the final net value of the product is probably not less on the average than 50 cents a day, or $142,375,000. Combining these aggregates, that is, first, the direct loss in wages; second, the direct cost of sickness itself; and third, the economic loss to industry, the total may conservatively be placed at $854,250,000 per annum.

In none of these calculations has any account been taken of permanent invalidity, which entails a very heavy burden upon the wage-earners as a nation, as well as upon public and private charity, and the general tax burden, local, State, and Federal. It would be a difficult matter to estimate even approximately the amount of that burden, but there can be no question of doubt but that the burden is a very heavy one indeed. The weight of the burden is not measured by the mere monentary equivalent required in the form of adequate workmen's pensions, for no pension payment can ever relieve much more than the bare necessities of the results of permanent industrial incapacity resulting from disease or industrial casualties.

Equally important is the element of excessive mortality, which requires more qualified consideration than the subject has thus far received. Estimating the death rate among American wage-earners at only 10 per 1,000, and applying this rate to the 33,500,000 wage-earners estimated for the year 1910, there occur annually 330,500 deaths among them, and of this number certainly one-fourth are due to diseases or accidents more or less preventable.

The average age at death in typhoid fever, for illustration, is 29.5 years for males and 27.8 years for females. At this age the normal expectation is about 37 years, while the economic expectation (if that term may be used) is from 35 to 37 years, or the difference between 30 and 65, as the rational limit of a working lifetime. Every man who dies from typhoid fever and who at the time of his death was a useful productive factor of the community, involves, therefore, a loss to the nation of the net value of his future earnings between the time of sickness commencement and the age of 65 as the terminal year of a reasonable working lifetime. In tuberculosis of the lungs the average age at death is 37.6 years for males and 33.6 years for females. In rheumatism it is 41.9 for males and 44.0 for females. In chronic poisonings it is 46.0 for males and 48.7 for females. In accidental poisonings it is 25.9 for males and 22.7 for females. In deaths from injuries by machinery it is 35.1 for males and 33.9 for females. In deaths from injuries in mines and quarries it is 33.6 for males and 27.5 for females. In railroad accidents and injuries it is 37.1 for males and 39.0 for females, etc. These figures have their significance and do not require to be enlarged upon. They afford a basis for estimating the economic loss involved in premature or preventable deaths, and measure approximately the waste of human health and life as the result of causes and conditions which, according to modern knowledge, are more or less subject to individual or social control.

It is evident from the foregoing that occupational diseases and accidents involve serious questions of community responsibility. The legal and social responsibility of the employer has long since been recognized in employers' liability laws, which are gradually being replaced by more equitable and rational workmen's compensation acts. Issues of far-reaching importance are involved in pending and proposed legislation of this kind. Justice to both employer and employee on the one hand, and the interests of the nation as a whole on the other, require that such legislation shall not only be in conformity to the best experience which has thus far been had abroad, but that it shall conform to the facts of actual experience in this country. As yet we are almost in complete ignorance as to what the facts really are. Investigations into the health conditions of every industry are required, but they should be made by qualified ability and not by amateurs seeking temporary notoriety by over-emphasizing exceptional conditions which are a mere passing phase of our industrial life. There is, no doubt, much that is deplorable in American industry, and this should be changed and improved, or entirely done away with, but there is also an overwhelming amount of evidence that wonderful progress has been made within the last twenty years, and that employers of labor, and particularly large corporations, have of their own account, and with foresight and rare insight done much to ameliorate the conditions under which modern industry is carried on. An awakened public conscience is at last being aroused to accelerate the slowly moving forces for social and industrial betterment. The truth requires only to be known to produce a remedy for intolerable or needlessly injurious conditions. It is the duty of those who are qualified to do so to ascertain the truth of the actual conditions affecting the longevity and physical wellbeing of American wage-earners, and it is a hopeful sign of the times that this conference has been called to undertake this work.

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